

REMARKS

I. Status of Claims

Claims 23-29 are pending. No claims are amended herein.

II. Rejection Under 35 U.S.C. § 103(a)

The Examiner maintains the rejection of claims 23-29 under 35 U.S.C. § 103(a) as being allegedly unpatentable over U.S. Patent No. 5,632,964 to Ishii et al. ("Ishii") in view of U.S. Patent No. 6,749,819 to Otsuka et al. ("Otsuka") and U.S. Patent No. 5,213,767 to Smith et al. ("Smith"). See Mar. 4, 2008, Final Office Action at 4-6.

Applicants respectfully traverse the rejection for the reasons of record and for at least the following reasons.

Several basic factual inquiries must be made in order to determine the obviousness or non-obviousness of claims of a patent application under 35 U.S.C. § 103. These factual inquiries, set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 17, 148 U.S.P.Q. 459, 467 (1966), require the Examiner to:

- (1) Determine the scope and content of the prior art;
- (2) Ascertain the differences between the prior art and the claims in issue;
- (3) Resolve the level of ordinary skill in the pertinent art; and
- (4) Evaluate evidence of secondary considerations.

The obviousness or nonobviousness of the claimed invention is then evaluated in view of the results of these inquiries. *Graham*, 383 U.S. at 17-18, 148 U.S.P.Q. at 467; see also *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1730, 82 U.S.P.Q.2d 1385, 1388 (2007).

Indeed, to establish a *prima facie* case of obviousness, the Examiner must:

make a determination whether the claimed invention "as a whole" would have been obvious at that time to that person. Knowledge of applicant's disclosure must be put aside in reaching this determination, yet kept in mind in order to determine the "differences," conduct the search and evaluate the "subject matter as a whole" of the invention. The tendency to resort to "hindsight" based upon applicant's disclosure is often difficult to avoid due to the very nature of the examination process. However, impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art.

M.P.E.P. § 2142. "The key to supporting any rejection under 35 U.S.C. § 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious."

Id. It is important to note, moreover, that each prior art reference relied upon in a rejection "must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention." M.P.E.P. § 2141.03(VI); *see also Graham*, 383 U.S. at 17, 148 U.S.P.Q. at 467.

Here, the Examiner has not established a *prima facie* case of obviousness because the claimed invention as a whole would not have been obvious in view of Ishii, Smith, and Otsuka when considered as a whole. Specifically, as the Examiner acknowledges, Ishii does not teach or suggest all of the claim limitations, and one skilled in the art would not have had any reason to modify Ishii or rely on Smith and Otsuka, as proposed by the Examiner.

According to the Examiner, Ishii purportedly "teaches a method for cleaning exhaust gas which contains both ammonia and metalorganics such as trimethyl gallium and trimethyl indium" *Id.* While conceding that Ishii "fail[s] to teach a zone comprising a bed of metal and a bed of metal oxide heated in a range of 200-700°C to cause metalorganic vapor to decompose," the Examiner notes that Ishii "teach[es]

treating trimethyl metals and silane.” *Id.* at 4-5. The Examiner relies on Smith to allegedly cure this deficiency, asserting that Smith “teach[es] a process for converting hazardous gases by chemical reactions into gaseous products . . . wherein gases such as silane and trimethyl borate . . . are decomposed in a first stage of granular silicon . . . and a second stage of granular lime . . . at a temperature of 200-500°C” *Id.* at 5. The Examiner concludes that it would have been obvious to convert hazardous gases by chemical reaction into gaseous products, wherein gases such as silane and trimethyl borate are decomposed in a first stage of granular silicon and a second stage of granular lime at a temperature of 200-550°C in Ishii in order to treat substantially similar hazardous gases. *See id.*

In their prior response, Applicants noted that one of ordinary skill in the art would not have looked to Smith in order to modify Ishii to solve the problem addressed by the present invention. In particular, unlike Ishii and the claimed invention, Smith is directed to removing halogen gases by a two-stage reaction from an exhaust gas, rather than treating an exhaust gas containing an organometallic compound. The Examiner, however, appears to dismiss this point, arguing that, besides treating halogens, “Smith also teaches treating organometallic compounds” because it “also describes treating gases comprising trimethylborate and trimethylphosphite.” Mar. 4, 2008, Final Office Action at 2.

Applicants acknowledge that Smith discloses that trimethylborate and trimethylphosphite gases are “sometimes found in the effluent of PECVD [Plasma Enhanced Chemical Vapour Deposition] operations.” *See* Smith, col. 1, lines 27-32 (emphasis added). However, in the case of PECVD, trimethylborate and

trimethylphosphite are only present as dopants, i.e., they are only present in parts-per-million concentrations. See, e.g., Wolf et al., Silicon Processing for the VLSI Era, Volume 1: Process Technology at 193 (2nd Ed. 2000) (Doping of PECVD tetraethyl orthosilicate oxide done by adding trimethylborate and trimethylphosphite) (copy attached hereto). In contrast, in the case of MOCVD (metal organic chemical vapour deposition), one of the processes in which the claimed invention may be used, the metalorganic sources (e.g., trimethyl aluminium, trimethyl gallium, trimethyl indium) are principal components of the compound being grown, and are, therefore, present in concentrations one million times greater than what would be present in the PECVD process focused on by Smith. See Specification as-published (U.S. Patent Application Publication No. 2005/0123463 A1) at ¶ [0003]. In other words, one of ordinary skill in the art properly considering Smith as a whole would recognize that Smith's treatment of metalorganic compounds is merely incidental at best and would not have considered Smith for the removal of metalorganic compounds present in amounts significantly greater than the amounts that would be present in the process disclosed in Smith.

Further, in their prior response, Applicants noted that Smith is not concerned with the catalytic degradation of ammonia or the use of any catalyst, or the prevention of the poisoning of a catalyst. The Examiner merely responds that Smith is not relied upon for these points. See Mar. 4, 2008, Final Office Action at 2. Regardless of whether the Examiner relies upon Smith for these points or not, the Examiner cannot rely upon selected portions of Smith to the exclusion of other portions which would have dissuaded one skilled in the art from looking to Smith in order to modify Ishii. See *In re Wesslau*, 147 U.S.P.Q. 391, 393 (C.C.P.A. 1965) ("It is impermissible within the

framework of section 103 to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art.”).

Here, unlike Ishii and the claimed invention, Smith as a whole is unconcerned about the catalytic degradation of ammonia using an ammonia decomposition catalyst to convert the ammonia into nitrogen and hydrogen. One of ordinary skill in the art considering Smith as a whole would understand that Smith is primarily concerned with and teaches a two-stage reaction for removing halogen gases (see, e.g., Smith, col. 2, lines 53-64), which is unrelated to the reaction described and claimed in the present application to remove different chemicals. The Examiner, however, again reiterates that Smith also discloses treating trimethylborate and trimethylphosphite gases. See Mar. 4, 2008, Final Office Action at 3. As discussed above, this ignores *Graham* and its progeny, including *KSR*, by failing to consider Smith as a whole, including the fact that trimethylborate and trimethylphosphite gases in Smith are merely present as dopants.

Moreover, Smith is silent about the use of an ammonia decomposition catalyst or the prevention of the poisoning of that catalyst by carbon deposition. Indeed, Smith merely mentions in passing that the heated silicon of the first stage of the process “causes complete or partial breakdown” of effluent gases, including ammonia, “which will be wholly or partially retained by the silicon.” Smith, col. 3, lines 27-33.

Accordingly, Smith, unlike Ishii, is unconcerned about the catalytic degradation of ammonia or the use of any catalyst, or the prevention of the poisoning of that catalyst.

Finally, in their prior response, Applicants argued that one of ordinary skill in the art would not have been motivated to replace Ishii’s simple device operable at room

temperature with Smith's more complex one requiring a heater. In response, the Examiner argues that combining the stages into one reactor would preclude the need for separate temperature controls and save costs. See Mar. 4, 2008, Final Office Action at 3. The Examiner further argues that there does not appear to be an disadvantage or disincentives for making the combination. See *id.*

Applicants respectfully submit that the remarks in the Final Office Action fail to properly consider Ishii and Smith as a whole. In particular, Ishii explains that the ammonia decomposition reaction "is an endothermic reaction," and as a result, the column containing the decomposition catalyst must be heated to elevated temperatures. See Ishii, col. 5, lines 8-14; see also U.S. Patent Application Publication No. 2006/0099123 A1 at ¶ [0005] (Ammonia decomposition reaction "is an endothermic process and the gases and the catalyst need to be heated"). In contrast, for the first stage of Ishii, contacting the exhaust gas with a cleaning agent comprising soda lime is not endothermic, and, therefore, there does not appear to be any reason to heat the column where this reaction occurs. Indeed, Ishii specifically states that "the contact temperature of the gas to be treated with the cleaning agent A is preferably 100°C. or lower and the contact treatment can be usually carried out at room temperature." *Ishii*, col. 4, lines 7-10. Ishii explains that soda lime containing free water, preferably from about 5 to 20%, has a high cleaning ability. See *id.* at col. 3, lines 57-61. Heating the soda lime to elevated temperatures could have a detrimental affect on the cleaning ability of the soda lime, e.g., if it were to cause removal of a necessary amount of free water. In contrast, in the different process disclosed in Smith, the soda lime is heated to an elevated high temperature, which appears to facilitate Smith's stated requirement of

keeping the lime free of water vapour during storage. See Smith, col. 4, lines 5-11.

Accordingly, one of skill in the art would not have had any reason to modify the temperatures used in the lime soda stage of Ishii with the elevated temperatures disclosed in Smith. Further, based on Ishii's disclosure that the soda lime performs better when containing free water, one of ordinary skill in the art would not have had a reasonable expectation of success if the temperatures disclosed in Smith were used in Ishii.

For at least all of these reasons, one of ordinary skill in the art would not have had any reason to combine Smith with Ishii in the manner suggested by the Examiner. See *KSR*, 127 S. Ct. at 1740-41, 82 U.S.P.Q.2d at 1396 (recognizing that a showing of "teaching, suggestion, or motivation" could provide helpful insight in determining whether the claimed subject matter is obvious under § 103(a)).

The Examiner also concedes that Ishii fails to "teach an embodiment wherein the first and second treating steps occur in a single chamber sub-divided into two zones." Mar. 4, 2008, Final Office Action at 5. The Examiner, however, argues that it would have been obvious to modify Ishii in this way in order to recognize "benefits of economy of scale." *Id.* Moreover, relying on Otsuka to allegedly evidence the state of the art, the Examiner argues that it would have been an obvious variant to combine the separate chambers into a single chamber having two portions. See *id.* at 5-6.

While Applicants acknowledge that Figure 2 of Otsuka discloses the use of a single chamber, Otsuka is directed to a completely different process than what is disclosed in Ishii, and, for that matter, what is claimed in the present application. Specifically, Otsuka discloses a process for purifying ammonia by contacting ammonia

with a catalyst comprising manganese oxide and thereafter with a synthetic zeolite to remove oxygen, carbon dioxide, and moisture. See Otsuka, Abstract. The single chamber in Figure 2 contains both the manganese oxide catalyst and the synthetic zeolite. See *id.* at col. 9, lines 50-53. The process disclosed in Otsuka, however, says nothing about using a catalyst to decompose the ammonia into nitrogen and hydrogen. In fact, an object of the process disclosed in Otsuka is to “prevent[] hydrogen from being generated by the decomposition of ammonia even at a relatively high contact temperature.” *Id.* at col. 3, lines 9-16. In stark contrast, Ishii discloses a process whereby ammonia is decomposed into nitrogen and hydrogen. Accordingly, one skilled in the art would not have looked to Otsuka to combine the separate chambers of Ishii into a single chamber because the processes disclosed in both references are inapposite.

For at least these reasons, Applicants respectfully submit that a *prima facie* case of obviousness has not been established and request that the rejection be withdrawn.

Conclusion

Applicants respectfully request that this response be entered by the Examiner, placing claims 23-29 in condition for allowance.

In view of the foregoing remarks, Applicants submit that all of the claims are allowable. Applicants, therefore, request the Examiner's reconsideration of the application, and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge
any additional required fees to our Deposit Account No. 50-4244.

Respectfully submitted,

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ATTACHMENT: Wolf et al., Silicon Processing for the VLSI Era, Volume 1: Process
Technology, 191-193 (2nd Ed. 2000)